

Review of the Draft ECOFRAM Terrestrial Report
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Overview

This review considers aspects of the report related to estimating exposure and more general issues concerning the structure of the assessments. Since I have no expertise in the area of toxicity testing and extrapolating toxicity test results or deriving distributions from these, those areas will not be addressed in this review. Therefore, I will not attempt to address those areas in this review. The review comments are presented as responses to the questions posed by the agency.

As an EPA-ORD representative at this workshop, I would like to point out two research efforts within ORD which may be of interest to OPP's efforts to improve their ecological assessments. First is the HWIR-FRAMES software. This is an object-oriented package developed to perform a national risk assessment (ecological and human based) of land-based waste management units. Although this platform is not directly applicable at present to pesticide assessments, it contains many modules which would be required and includes an uncertainty analysis structure. This package is developed in a modular fashion and has the potential to be adapted for terrestrial pesticide assessments. Dave Brown (706-355-8200) and Gerry Laniak (706-355-8316) are good contacts for this projects. I am certain either would welcome input from and discussion with the program office.

On a general note, I felt the report provided an overall structure for improving ecological risk assessments and substantial detail within one piece of the process -- the probability of individual field scale mortality for bird. My greatest concern is the relevancy of developing detailed methods for assessing this field scale mortality (avian) while other elements -- e.g. spatial analysis for performing an initial hazard assessment, approaches for non-avian species, estimations of population level effects -- are only generally addressed. This emphasis is no doubt an interpretation of the SAP and "Charge to the Terrestrial and Aquatic Workgroups" directives and represents the first stage in a comprehensive overhaul of the terrestrial ecological assessment.

Response to Question 1

1. Is the draft report scientifically sound? If not, please explain and provide specific suggestions on how to improve the report to make it scientifically sound.

In terms of the exposure pathways and estimates, the report is sound. The process review is thorough and comprehensive. In general, the consideration of exposure pathways was thorough, but the report did not consider soil invertebrates as a significant exposure pathway. Several excellent papers exist measuring bioconcentration of toxics between earthworms and soils (e.g. Beyer and Gish, 1980) and models of uptake and bioconcentration by earthworms (e.g. Lord, et al.). Given, the level of detail and number of pathways considered in the review and the fact that there is an extensive body of literature on uptake of toxics, earthworms could easily be included as a potential exposure route. The review of earthworms as an exposure pathway for vertebrates would also providing a base for the important for moving beyond vertebrates as an assessment endpoint. Earthworms would appear to be a logical next species for consideration given their economic importance -- in addition to being food stuff for birds -- and relatively simple methods which could be applied to estimate exposure.

Response to Question 2

2. Did the ECOFRAM Workgroup address the “Charge to the Terrestrial and Aquatic Workgroups” identified in the background document, “Evaluating Ecological Risk: Developing FIFRA Probabilistic Tools and Processes” (Attachment #3)? If not, please explain why not and provide specific suggestions on how the “Charge” could be addressed.

From the narrow viewpoint of developing distributions of possible mortality of individuals (avians) at a field scale, the report does a very thorough job of delineating approaches. My greatest concerns about the ECOFRAM report arise from the “Charge” to the group. Two of the greatest limitations for doing an ecological risk assessment were preset by the “Charge” namely the directive to focus primarily on direct effects to terrestrial vertebrates. The workgroup nominally limited this to birds and mammals but has functionally directed the assessment considerations to avian species. This may be appropriate if in fact avian species are more likely than other classes of vertebrates to be impacted by agriculture pesticide. However, the report would be significantly strengthened if the case that avians as the species most likely to be impacted was made directly. Even within the limitations of the “Charge”, too little emphasis was place on selection of endpoints.

Reptiles and amphibians are not considered . If these species are not sensitive, literature to that effect needs to be cited. At present, data is not currently required for members of either group. A literature review should be conducted in the initial EcoFRAM development to determine if the assumption to discount these species is valid and they do not need to be incorporated into a testing program. Since toxicity testing can be expensive, there will obviously be a trade off between testing additional species and the expanded avian effects testing as recommended in the document.

Response to Question 3

3. What are the limitations for prediction of risk using the approach described in the draft report? Please provide specific suggestions.

A major limitation for prediction of risk is the detailed focus on individual mortality removed from the context of population and community impacts. The concept of the “threshold of acceptability” and its definition are critical for genuinely moving the probabilistic calculations toward assessing an ecological impact. Theoretically, this threshold should be defined with respect to effects on population levels at both local and regional scales as well as on the basis of a risk benefit analysis. The report would be significantly strengthened if it included methodical approaches for defining the “threshold of acceptability.” At present, the report simply defines the concept and uses it in an example. Approaches for defining the threshold are critical in making the probabilistic risk assessments meaningful.

The development of probabilistic based assessments for individual (avian) mortality will most likely reduce the risk estimate for the chosen endpoint. If implementing the procedures detailed in the ECOFRAM terrestrial assessments occurs before the more holistic phases occur (inclusion of additional species, indirect effects, population and community level impacts) with the accompanying reduction in conservatism, other species, populations, and community are at an increased risk. Before moving much farther along in the levels of refinement for avian mortality distributions, the assessments should be broadened to other species, evaluating other limitations for the species (e.g. habitat carrying capacity), integrating a spatial context into assessments, and estimates of population level effects. Although many of these issues are raised in the report, they are simply mentioned and little effort have gone into laying out approaches for addressing them.

Response to Question 4

4. Taking into account your answers to the three questions above, what areas of the report need to be strengthened? If possible, please provide specific recommendations for how to strengthen the report.

The report would be strengthened by a wider range of expertise in the workgroup. The workgroup membership is heavily weighted toward avian toxicity expertise. Although terrestrial vertebrates were targeted as the first step in the ECOFRAM development process, this report needs to set the stage for subsequent efforts. The utility of the report would be enhanced with a generalized layout for a holistic risk assessment including other ecosystem components.

This document would be improved with increased attention to use of geographic data. The report focuses on the distribution of risk to a species in the vicinity of a field, but it provides no structure to evaluate the distribution of the species with respect to the distribution of the fields. Use of spatial data can be incorporated into initial assessments to develop information on the co-occurrence of the likelihood of pesticide use (based on the agroecosystem) and the range of the species to allow estimation of the proportion of the ecological resource at risk. Factors such as the proportion of the resource at risk and the recovery potential for the resource should be a

component in the development of the “threshold of acceptability. If most of a species range is within agroecosystems where the product will likely be then a lower threshold would be warranted.

Response to Question 5

5. At what point in the risk assessment process is the certainty level high enough to support the consideration of risk mitigation? What is the minimum level of technical information and scientific understanding that is necessary to evaluate whether risk mitigation would be necessary and/or effective?

In general, the emphasis for ecological assessments should be on impacts to populations and higher levels of organizations not individual mortality. Adding distributions and generating probabilities for mortality does not address population level effects until these have been linked to at least a likelihood of a significant population level effect at local and regional scales. Risk mitigation should consider relative risk. If a population is declining due to habitat destruction, mitigation of pesticide impacts becomes an inappropriate investment.

REFERENCES

- Beyer, W. N, and Gish, C.D. 1980. “Persistence in Earthworms and Potential Hazard to Birds of Soil Applied DDT, Dieldrin, and Heptachlor.” *Journal of Applied Ecology*, 17, pp. 295-307.
- Lord, K.A., G. G. Briggs, M.C. Neale, and R. Manlove. 1980. “Uptake of Pesticides from Water and Soil by Earthworms.” *Pesticide Science*, 11, pp. 401-408.